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THE BIRDS OF NORTH CLIFFE WOOD

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Introduction

North Cliffe Wood occupies an area of about 34 ha. and lies on the eastern side of the Plain of York about 1 km. west of the village of North Cliffe (GR 44/873.370). Between 1955 and 1982 it was owned by E. B. Burstall, a keen birdwatcher who lived at North Cliffe Lodge adjacent to the Wood. In 1982 the Wood was acquired as a nature reserve by the Yorkshire Wildlife Trust.

Burstall purchased the Wood from Houghton Estates, which still owns the shooting rights and manages the site as a "wild" shoot. Partly because of the control of "vermin", perhaps, the rabbit population is so high that the natural regeneration of trees is negligible.

During Burstall's ownership and probably for several decades before he bought it, the vegetation of the Wood was largely unmanaged. Management activity began a few years after the Trust acquired the Wood and intensified as time progressed. Notable projects undertaken have been the felling of mature sycamore (*Acer pseudoplatanus*)* trees in the northern sections in 1987, the planting of a considerable number of oak (*Quercus robur*) saplings, begun in 1988 and the coppicing of willows (*Salix cinerea*) which were invading a small area of *Phragmites* fen, begun in 1989 but still not completed. In 1994 the Trust expects to embark on an attempt to restore about 5 ha. of heathland on the western side which have been largely overgrown by birch (*Betula pubescens*).

In April 1990 the author began monitoring the birds of the Wood to provide a reference base for determining the long-term effects of the management. Monitoring continued until March 1993, thus incorporating two of the three exceptionally dry years from 1989 to 1991 inclusive. This period of drought ended in July 1992.

Vegetation

Altogether 28 species of tree and shrub have been recorded in North Cliffe Wood including a few individuals each of *Larix sp., Pinus sylvestris* and *Picea abies* and a single specimen of *Taxus baccata*. The most common tree by far is *Betula pubescens* but there is one large stand of *Alnus glutinosa* and several small ones. Individuals of *Quercus robur* are scattered throughout the Wood but there are also two small stands on the eastern side. In various parts there are dense clumps of shrubs, *Salix cinerea*, *Corylus avellana*, *Prunus spinosa*, *Sambucus nigra* and *Rhododendron ponticum*.

As is to be expected from the presence of *Alnus glutinosa* and *Salix cinerea*, parts of the Wood are wet. Indeed, even in normal winters much of the soil surface is flooded. The soil is derived from aeolian sand and over much of the Wood this sand is compacted below about 0.75m, so it is likely that the winter water table is perched above the compacted layer. In May, when the trees come into leaf, the water level begins to drop rapidly. Nevertheless there is a small area of about 0.25 ha. of *Phragmites* fen, probably indicating the site of a former mere, another area of similar size of *Carex riparia* fen and several small areas of other wetland species such as *Iris pseudacorus* and *Lythrum salicaria*.

In the second half of the 19th century the Wood was extensively drained. The drains are still present though only one, which passes east-west through the centre, still flows. It is likely, therefore, that in the past the Wood has been much wetter than it is today. A brief account of the history of the Wood is given by Boatman (1993) where it is suggested that this drainage, together with the installation of a deep drainage system in the fields to the west in 1946/7, has enabled *Pteridium aquilinum* to spread almost throughout the drier parts. Today this species dominates the ground vegetation over about 60% of the Wood.

*Plant nomenclature follows Clapham, Tutin and Moore (1987)

METHOD

During each summer (April to September) of 1991 and 1992 and each winter (October to March) of 1991/2 and 1992/3 the Wood was visited on 15 occasions. In the summer of 1990 and the winter of 1990/1 it was visited on 8 and 10 occasions respectively. The visits were spread over each season as uniformly as possible. Each visit lasted from about 9.30 am until about 12.30 pm and the same route was followed on each occasion, though on successive visits the direction taken was reversed. The route is shown in Figure 1.

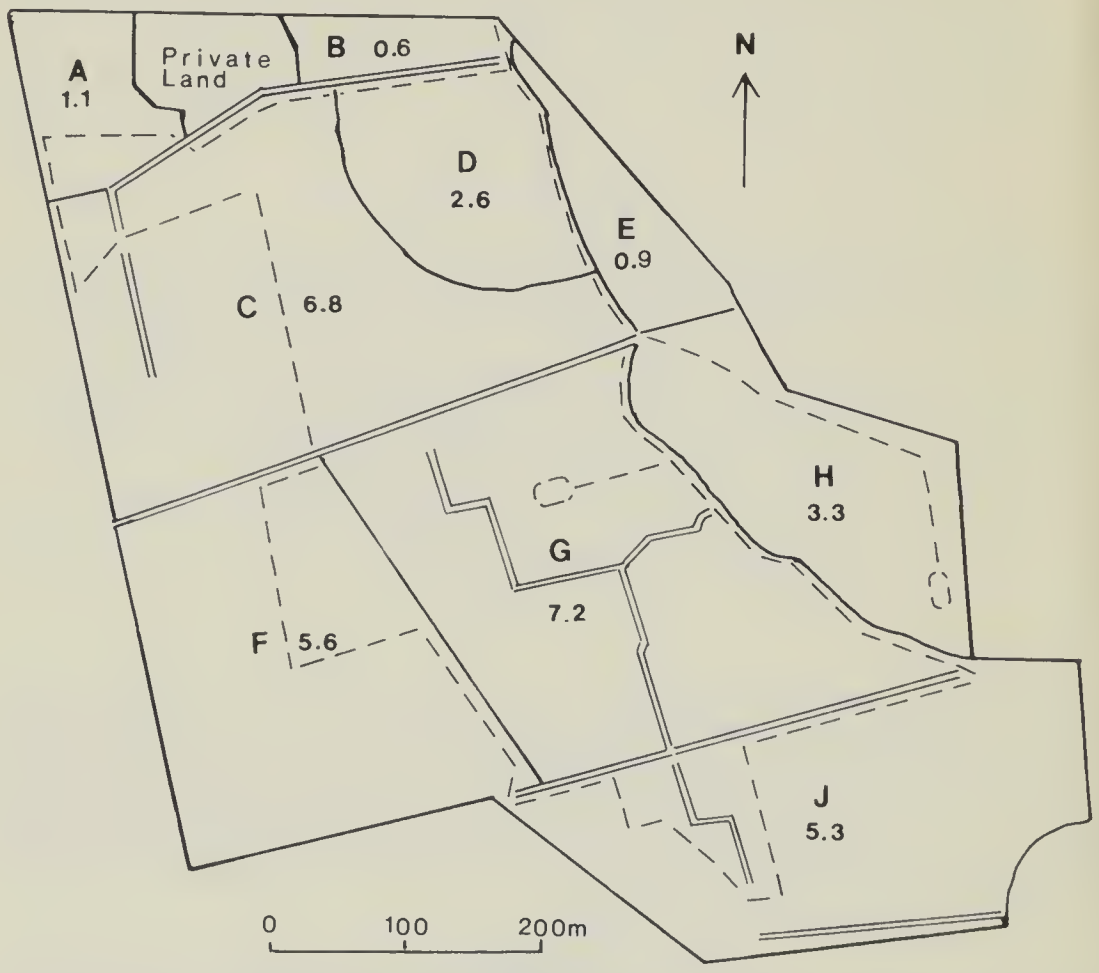

FIGURE 1

Outline map of North Cliffe Wood showing the main drains, the boundaries and areas of the compartments and the route followed for the survey.

═══	Drain	A – J Compartments
———	Compartment boundary	0.0 Area (ha.)
- - - - - -	Route followed	

For management purposes the Wood had already been divided into 9 compartments and this division was used as a basis for recording the birds. On each visit the species seen or heard in each compartment were recorded. This method of recording is similar to that described by Yapp (1962) for comparing the distribution of species between different types of woodland. Yapp selected a number of sample plots of each woodland type (to which the compartments of North Cliffe Wood can be regarded as equivalent) and, after recording the species encountered in each, determined the proportion within each type in which each species occurred. This proportion he called the "frequency". Thus for any one visit in the present work, the number of compartments in which a species occurred can be regarded as

a measure of the frequency for that species.

The boundaries and areas of each compartment are shown in Figure 1. In Table 1 the more important species forming the tree, shrub and field layers along those parts of each compartment sampled are recorded.

TABLE 1

Main components of the tree, shrub and ground layers in the compartments.

	Tree	Shrub	Ground
A	*Betula pubescens* *Sorbus aucuparia*		*Rubus fruticosus*
B	*Betula pubescens*		*Pteridium aquilinum* *Rubus fruticosus*
C	*Betula pubescens* *Alnus glutinosa*	*Corylus avellana* *Salix cinerea*	*Dryopteris dilatata* *Pteridium aquilinum*
D	*Betula pubescens*		*Pteridium aquilinum*
E	*Quercus robur*	*Rhododendron ponticum*	*Pteridium aquilinum*
F	*Betula pubescens*		*Pteridium aquilinum* Bare ground
G	*Betula pubescens* *Alnus glutinosa*	*Corylus avellana*	*Pteridium aquilinum* Mixed herbs
H	*Betula pubescens* *Alnus glutinosa* *Quercus robur*	*Corylus avellana* *Sambucus nigra*	*Pteridium aquilinum* Mixed herbs
J	*Betula pubescens*	*Salix cinerea*	*Pteridium aquilinum* *Phragmites australis*

Results

In Table 2 the mean frequencies for all species recorded on more than 5 occasions throughout the period of the survey are presented for each season. These values, it is believed, can be regarded as a crude measure of the relative abundance of different species, at least between birds of similar habits, i.e. within families or sub-families, because the more abundant a species is within a compartment the more likely it is to be recorded. Thus, in summer, the Robin and Blackbird appear to be the most abundant members of the thrushes (*Turdinae*), the Willow Warbler of the warblers (*Sylviinae*), the Chaffinch of the finches (*Fringillidae*) and the Blue Tit and the Great Tit of the tits (*Paridae*). Apart from the mean frequency, general experience leaves the impression that the most abundant species of all is the Wren. This is the only non-game species which has frequently been seen to emerge from bracken.

It should be noted here that the mean frequencies for the warblers are low relative to those for other species because they begin to move away from their breeding areas about mid-summer. If the values for the summers of 1991 and 1992 are re-calculated for the period from mid-April to the end of June they become, respectively, 1.2 and 2.8 for the Garden Warbler, 2.5 and 3.0 for the Blackcap and 7.2 and 6.2 for the Willow Warbler.

Apart from summer and winter visitors, the mean summer and winter frequencies for most species are of a similar order. Exceptions are the Wood Pigeon and the Chaffinch, both of which appear to be much less frequent in winter than in summer. In general, the winter avifauna of the Wood appears to be quite rich and it is pleasing to note that it provides a winter refuge, albeit perhaps only a temporary one in some cases, for species such as Redwing, Goldcrest, Jay, Redpoll and Siskin.

TABLE 2

Mean number of compartments in which species were encountered (mean frequency) in each of 6 seasons. Only those species recorded on more than 5 occasions in total are included. For the most common species the order of frequency is indicated (see text) together with that for birch and oak woods according to Yapp (1962).

Species	Sum 90	Win 90/1	Sum 91	Win 91/2	Sum 92	Win 92/3	Frequency order NCW	Yapp Birch	Yapp Oak
Number of visits	8	10	15	15	15	15			
Mallard (*Anas platyrhynchos*)	0.2	–	0.5	–	0.2	–			
Sparrow Hawk (*Accipiter nisus*)	0.2	0.4	0.2	0.3	0.2	0.2			
Pheasant (*Phasianus colchicus*)	2.5	1.9	3.1	2.0	2.3	2.3			
Moorhen (*Gallinula chloropus*)	0.1	–	0.3	–	–	0.1			
Woodcock (*Scolopax rusticola*)	0.5	0.5	0.5	0.2	0.2	0.2			
Wood Pigeon (*Columba palumbus*)	4.5	1.8	6.5	1.5	5.6	1.7	4	–	6
Cuckoo (*Cuculus canorus*)	0.5	–	0.1	–	0.2	–			
Green Woodpecker (*Picus viridis*)	0.2	0.1	0.1	–	0.5	0.1			
Great Spotted Woodpecker (*Dendrocopus major*)	0.9	0.2	0.7	0.6	1.0	0.9			
Wren (*Troglodytes troglodytes*)	5.6	6.1	6.6	7.3	7.5	6.9	1	4	3
Dunnock (*Prunella modularis*)	1.0	3.1	0.5	2.6	1.5	2.5			
Robin (*Erithacus rubecula*)	4.7	4.6	4.3	4.2	6.1	5.5	5	3	2
Blackbird (*Turdus merula*)	3.5	4.2	3.0	4.0	3.4	3.7	8	–	4
Song Thrush (*Turdus philomelos*)	0.4	0.1	0.4	0.1	0.7	0.2	–	–	9
Redwing (*Turdus iliacus*)	–	–	–	0.7	–	0.7			
Mistle Thrush (*Turdus viscivorus*)	0.2	–	0.3	0.1	0.2	0.3			
Garden Warbler (*Sylvia borin*)	0.1	–	0.4	–	0.9	–			
Blackcap (*Sulvia atricapilla*)	1.6	–	1.1	–	1.6	–			
Willow Warbler (*Phylloscopus trochilus*)	3.1	–	4.4	–	4.0	–	–	2	2
Goldcrest (*Regulus regulus*)	–	1.4	–	0.3	–	1.3			
Spotted Flycatcher (*Muscicapa striata*)	0.2	–	0.2	–	0.8	–			
Long-tailed Tit (*Aegithalos caudatus*)	1.0	1.1	0.9	2.3	1.2	1.6			
Marsh/Willow Tit (*Parus palustris/ montanus*)	1.2	1.8	1.2	1.3	1.4	1.0			

Coal Tit (*Parus ater*)	0.1	1.6	1.3	1.6	1.7	1.5			
Blue Tit (*Parus caeruleus*)	2.5	3.7	3.1	4.4	4.9	4.7	7	–	7
Great Tit (*Parus major*)	3.2	3.9	4.5	5.9	4.5	4.7	6	–	7
Tree Creeper (*Certhia familiaris*)	0.5	1.0	0.4	0.8	0.5	0.6			
Jay (*Garrulus glandarius*)	0.7	1.5	0.5	1.1	0.6	1.1			
Chaffinch (*Fringilla coelebs*)	5.4	2.6	6.3	3.3	6.4	3.5	3	1	1
Siskin (*Carduelis spinus*)	–	–	0.7	0.3	–	0.5			
Redpoll (*Carduelis flammea*)	–	0.3	0.1	0.7	0.1	0.1			
Bullfinch (*Pyrrhula pyrrhula*)	0.5	1.4	0.1	0.7	0.4	0.5			

The relative similarity of the mean frequencies from one year to another, particularly where they are generally low, gives credence to the value of this measure as a base reference for determining the effect of ongoing and future modifications to some of the habitats. The presence of values for some species which are exceptionally high (Redpoll, winter 91/2) or low (Goldcrest, winter 91/2), however, indicates that a comparative survey at a future date should extend over more than one year.

For management purposes, some measure of the current relative importance of the individual compartments would also be useful. If the number of times a species is recorded in a compartment in a season is the "constancy", a convenient measure would be the "total constancy", i.e. the sum of the constancy values for all species for a compartment in a season. This is considered to be a better measure than the number of species recorded in a compartment in a season because this latter gives equal weight to a species which is recorded only once and one which is recorded on several occasions. A direct comparison of total constancy values does not take account of the variation in area between the compartments but this can be allowed for by comparing the actual values with those expected from the regressions of total constancy values on area.

The total constancy values and regressions for the summers of 1991 and 1992 are shown in Figures 2 (i) and (ii) and those for the winters of 1991/2 and 1992/3 in Figures 2 (iii) and (iv). For Compartments F and G the values consistently fall below the regression lines, suggesting that these compartments are currently of relatively low value for birds, while for Compartments B, D and J the values fall below three of the four lines. Only the values for Compartments C and H consistently lie above the regression lines.

Analysis of variance of the regressions was undertaken and the 'F' ratios are shown for each regression in Figure 2. $'F'_{1,7} = 5.59$ at $P = 0.05$ so only the regression for summer 1991 was significant at this level of probability and even in this case the coefficient of determination (r^2) indicated that the regression was responsible for only 59.5% of the variation. Thus it appears that some factor other than area, probably the types of habitat available, was largely responsible for the variation in the total constancy values between compartments.

The extent to which the constancy of a species varies between compartments, in any season can be illustrated by calculating the coefficients of variation (standard error/mean). This coefficient ranges from 0 to 1 and the larger it is the greater the variation between compartments. The values for some of the more common species are given in Table 3. For each species they tend to vary from season to season but, for example, those for the Blackbird tend to be at the upper extreme, indicating a patchy distribution within the Wood as a whole, while those for the Wren tend to be at the lower extreme, indicating a relatively uniform distribution.

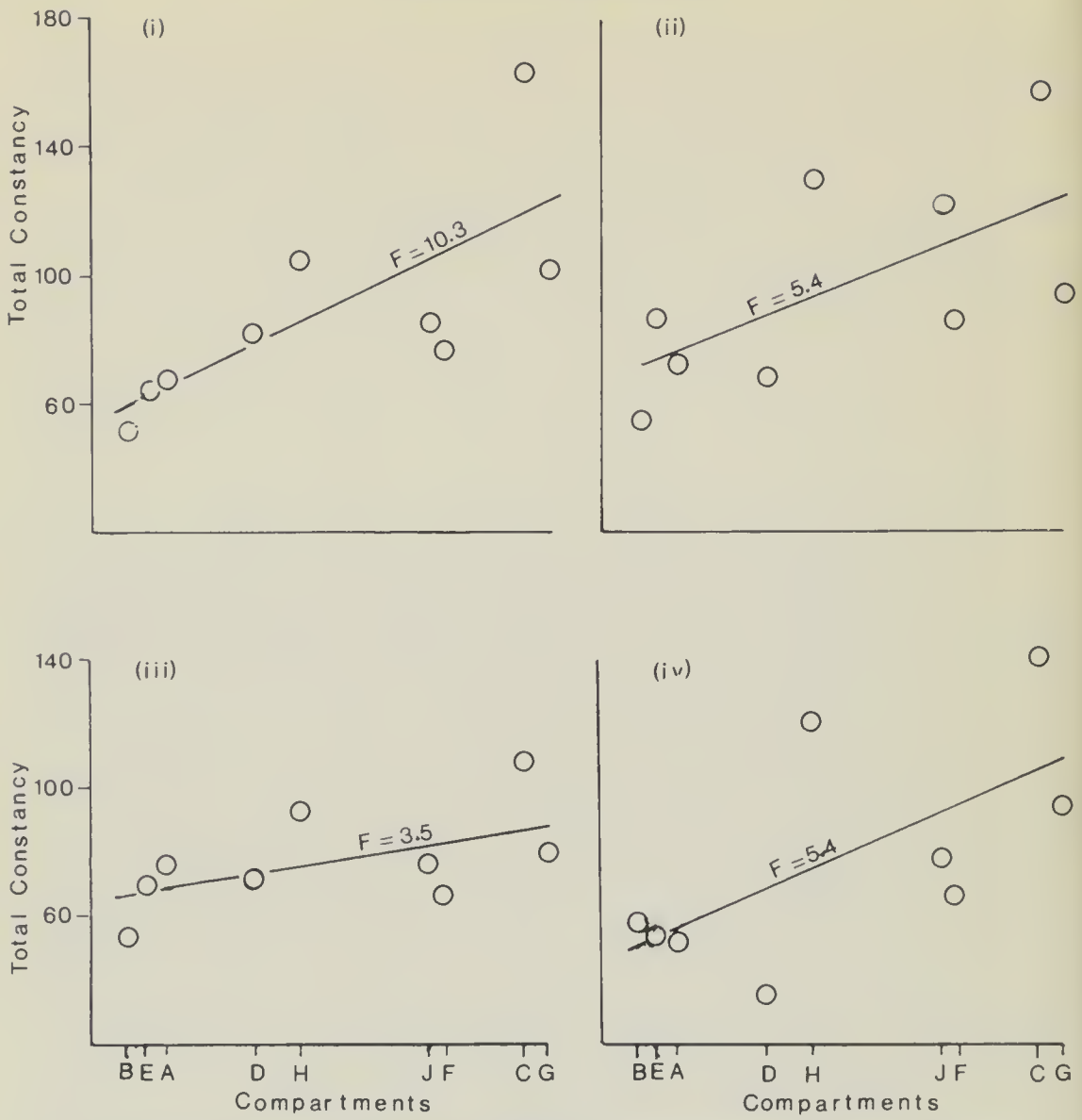

FIGURE 2

Total constancy values (0 – see text) for each compartment (A – J) for each of the four seasons summer 1991 (i), summer 1992 (ii), winter 1991/2 (iii) and winter 1992/3 (iv). The compartments are located on the horizontal axis according to their areas (ha) so the oblique lines represent the regression of total constancy on area. The 'F' values for each regression are also shown.

The consistency with which the more common species were recorded in the various compartments was investigated by comparing the constancies for the summers of 1991 and 1992 and the winters of 1991/2 and 1992/3. Spearman's rank correlation coefficients (r_S) were calculated for the purpose and the values, obtained are shown in Table 3. For 9 pairs of values $P = 0.05$ at $r_S = 0.68$ and $P = 0.01$ at $r_S = 0.83$ so the summer coefficients for the Wren and Blackbird are significant at $P<0.01$ and for the Wood Pigeon and Willow Warbler at $P<0.05$ while the winter values for the Wren, Blue Tit and Great Tit are all significant at $P<0.05$. Thus the species mentioned can be considered to be similarly distributed in the relevant pairs of seasons. It is worth noting that for the Robin and Blue Tit the mean frequencies for summer 1992 were considerably higher than those for 1991 (Table 2) so individuals might have been forced into less favoured compartments in 1992, thus reducing the values of r_S.

TABLE 3
Spearman's rank correlation coefficients (r_s) for selected species for the summers of '91 and '92 and the winters of '91/92 and '92/93 and the coefficients of variation (standard error/mean) for each season (see text).

	Summer 91 & 92			Winter 91/92 & 92/93		
	r_s	Coeff. of var.		r_s	Coeff. of var.	
		'91	'92		'91/2	'92/3
Wood Pigeon	0.80	0.31	0.50			
Wren	0.84	0.29	0.26	0.75	0.27	0.40
Willow Warbler	0.79	0.47	0.39			
Robin	0.37	0.40	0.32	0.62	0.51	0.50
Blackbird	0.84	0.79	0.64	0.38	0.40	0.74
Blue Tit	0.26	0.60	0.48	0.71	0.18	0.36
Great Tit	0.67	0.38	0.48	0.80	0.27	0.36
Chaffinch	0.15	0.27	0.16	-0.20	0.40	0.38

Apart from those species listed in Table 2 others encountered during the 3 years of the survey on 5 or fewer occasions were Teal, *Anas crecca*, Kestrel, *Falco tinnunculus*, Red-legged Partridge, *Alectoris rufa*, Tawny Owl, *Strix aluco*, Fieldfare, *Turdus pilaris*, Chiffchaff *Phyllocopus collybita* (summer of 1990 only), Magpie, *Pica pica*, Jackdaw, *Corvus monedula*, Carrion Crow, *Corvus corone corone*, Brambling, *Fringilla montifringilla*, Greenfinch *Carduelis chloris* and Goldfinch, *Carduelis carduelis*. Other species which have been seen on single occasions since 1982 but outside the survey period are Green Sandpiper, *Tringa ochropus*, Lesser Spotted Woodpecker, *Dendrocopus minor* and Nuthatch, *Sitta europaea*. In the early and middle years of the 1980s Black-headed Gulls, *Larus ridibundus*, formed a non-breeding colony in the vicinity of a shallow transient pond in Compartment G.

In 1983 Burstall presented the Trust with a list of the species seen in North Cliffe Wood by himself since 1948. Those species on his list which are not mentioned above, together with his comments on status, are as follows.

Grey Heron, *Ardea cinerea* – "occasionally visits pools in the Wood".
Hen Harrier, *Circus cyaneus* – "seen most winters".
Buzzard sp. *Buteo sp.* – "occasional winter visitor".
Water Rail, *Rallus aquaticus* – "occasional".
Stock Dove, *Columba oenas* – "a few residents".
Turtle Dove, *Streptopelia turtur* – "several nests in the Wood every year".
Long-eared Owl, *Asio otus* – "seen once in the Wood".
Nightar, *Caprimulgus europeaus* – "used to be a regular and fairly numerous visitor".
Woodlark, *Lullula arborea* – "3 or 4 pairs 1948-1958".
Tree Pipit, *Anthus trivialis* – "used to be a regular summer visitor to the Wood".
Redstart, *Phoenicurus phoenicurus* – "seen occasionally on passage".
Grasshopper Warbler, *Locustella naevia* – "occasional spring visitor".
Sedge Warbler, *Acrocephalus schoenobaenus* – "occasional visitor".
Lesser Whitethroat, *Sylvia curruca* – "occasional visitor".
Whitethroat, *Sylvia communis* – "used to be a reular visitor".
Wood Warbler, *Phylloscopus sibilatrix* – "very ocasional spring visitor".
Pied Flycatcher, *Ficedula hypoleuca* – "seen once in the Wood".
Golden Oriole, *Oriolus oriolus* – "visited the Wood in 4 separate summers".
Starling, *Sturnus vulgaris* – "common".
House Sparrow, *Passer domesticus* – "abundant resident".
Tree Sparrow, *Passer montanus* – "numerous resident until recently - decreasing".

Crossbill, *Loxia curvirostra* – "occasional winter visitor – nested once in mid 70s".
Yellow Hammer, *Emberiza citrinella* – "a few resident pairs".
Reed Bunting, *Emberiza schoeniculus* – "occasional in a damp part of the Wood".
Corn Bunting, *Miliaria calandra* – "occasional".

Discussion

In Table 2 the more frequent species in the summer lists for 1991 and 1992 (excluding the Pheasant) are numbered 1 to 9 in order of mean mean frequency i.e. the mean of the two sets of mean frequencies. The position of the Willow Warbler was determined using the data for mid-April to the end of June only. The summer frequencies obtained by Yapp (1962) from 13 English and Welsh birch woods and 13 pedunculate oak woods for species which were also recorded at North Cliffe Wood, are similarly numbered in order of frequency.

It can be seen that the same species occupy three of the first four places in the North Cliffe Wood and Yapp's birch wood lists but that the order is different. Thus the first three places in North Cliffe Wood are occupied by the Wren, Willow Warbler and Chaffinch respectively with the Wood Pieon in fourth place while in Yapp's birch woods the first three places are occupied by the Chaffinch, Willow Warbler and Robin respectively with the Wren in fourth place. In Yapp's birch woods the Tree Pipit and Redstart occupy the fifth and sixth places respectively, while the seventh place is occupied jointly by the Carrion Crow, Blue Tit, Pied Flycatcher and Wood Warbler. The last two species indicate a strong western influence in Yapp's data while the strong showing of the Tree Pipit and Redstart suggest that his woods were more open than North Cliffe Wood.

When the lists for North Cliffe Wood and Yapp's oak woods are compared, it can be seen that the first eight species are common to both but again that the order is different. Thus the bird population of North Cliffe Wood appears to resemble that of Yapp's oak woods more than his birch woods but this is probably a consequence of its eastern location and low altitude as pedunculate oak woods are a feature of the southern and eastern lowlands of England (Tansley 1938).

As appears usually to be the case in broad-leaved woodland, (Yapp, 1962, Simms, 1971), the Blackbird is much more common in North Cliffe Wood than the Song Thrush. According to Simms (1978) the favourite food of both species is earthworms but while the Blackbird commonly feeds on insects in woodlands the Song Thrush tends to rely on snails when earthworms are scarce. The soils of North Cliffe Wood, however, are sandy and acid so both earthworms and snails are likely to be very scarce. The highest pH recorded by Boatman (1993), in an area of wet *Salix* scrub, was 5.7 while for several samples from the drier parts the pH was as low as 3.2.

The presence of Redwings in North Cliffe Wood during the winters of 1991/2 and 1992/3 was rather surprising as the species usually overwinters in open country in Britain. They were encountered on most visits during these two winters and usually occurred in a small flock of up to 10 individuals. They were seen on the ground, apparently feeding, on several occasions.

Amongst the tits both Marsh Tit and Willow Tit were recorded but on a number of occasions birds seen failed to call. It was not possible, therefore, to determine to which species these individuals belonged so all records have been lumped together in Table 1.

In the summer of 1991 a flock of about 50 Siskins was seen regularly from mid-July until mid-October feeding in the birch canopy. The flock appeared to consist of young birds. In the summer of 1992 a Redpoll was heard singing as late as 12th May but no birds were seen or heard subsequently. Bullfinches were seen or heard fairly regularly but the only finch which was common in the Wood, particularly in summer, was the Chaffinch. The apparent movement of this species away from the Wood in winter, noted above, is normal according to Simms (1971). While the Chaffinch is recognized as a species of high forest other common finches, such as Greenfinch and Goldfinch, favour forest edges consisting of a broad zone of shrubs (Newton 1972). The boundaries of North Cliffe Wood,

however, are sharp, consisting mostly of either tall birch trees, a tall hawthorn hedge open in the lower part and adjacent to trees, or a rather gappy hawthorn hedge overshadowed by trees so this probably explains the scarcity of these species. It is possible that ongoing management of the boundary hedges, coupled with the restoration of grass heath on part of the reserve, might attract more species of finch in the future.

It is hoped that opening up parts of the reserve might attract species of more open country as well. The list of species recorded by Burstall but not encountered during the survey, gives an indication of the potential additions to the avifauna resulting from such activity. Those species on his list which are characteristic of open country or park-like woodland, e.g. Partridge, Stock Dove, Nightar, Tree Pipit were probably recorded when the Wood was much more open than it is at present (see Boatman 1993 for an account of the history of the Wood) and it is worth noting here that the areas it is intended to open up, i.e. Compartment F and part of Compartment J, are currently of relatively low importance for birds.

Finally Burstall's comments on the status of some species are rather surprising and it is possible that when making them he also had in mind sightings in the nearby countryside. Thus although the presence of Hen Harrier in North Cliffe Wood has been independently recorded by Mott (*pers. comm.*) it is unlikely that it would have been "seen most winters" once the canopy had closed. Similarly it is unlikely that the Nightar was ever "fairly numerous" in an area as small as the Wood itself but it might have been so in the general area at one time. It still bred occasionally in the neighbourhood of the Wood in the 1980s and one was seen in the Wood itself in 1989 (Allderidge, *pers. comm.*). So far as the comments about the Starling, House Sparrow and Yellow Hammer are concerned, it is probable that Burstall was influenced by what he saw in the grounds of North Cliffe Lodge adjacent to the Wood.

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BOOK REVIEWS

Where to Watch Birds in Yorkshire and North Humberside by **John R. Mather.** Pp. vi + 293, numerous illustrations and maps. Croom Helm. 1994. £12.99 paperback.

This is the latest in the highly regarded "Where to Watch Birds . . . " series from Croom Helm and covers those parts of 'old' Yorkshire currently included in the annual Y.N.U. Bird Report. A total of 156 sites at 93 main localities are described, ranging from Swaledale in the north-west down to Spurn Point in the south-east.

Each locality covered has sections describing the principal habitats, the species likely to be encountered, details of the best times to visit, access arrangements (together with a map) and a calendar detailing the birds that might be seen in each season.

With such a huge and diverse county, choice of sites was always going to be something

of a problem so the author has sensibly used ease of access as one of his main selection criteria. Undoubtedly, there will be arguments about whether certain locations should, or should not have been included, but in general the author is to be congratulated for managing to cover all of the major sites without neglecting less famous, but perhaps equally interesting, areas of the county. It is to be hoped that one of the spin-offs of the book will be better coverage of some of these 'minor' sites.

The major strength of the book is undoubtedly the excellent access details. In the foreword, the author makes it clear that he has personally visited each site and this shows in the detailed and clear instructions, which, together with the very good sketch maps, should ensure even the most directionally-challenged visitor won't go astray!

The bird lists in the species and calendar sections give a good flavour of the sites and hint at the possibilities of rarer visitors without over-emphasising the chances of seeing them. My only minor quibble is the use of the 'new' English bird names proposed by 'British Birds' Whilst I can appreciate the author's view that these will become the standard over the next few years, the repetition of 'common' and 'eurasian' is, aesthetically at least, less appealing for the reader.

This slight reservation aside, however, I can thoroughly recommend this superb guide to anyone with even a minor interest in the birds of England's largest and, to by biased mind, ornithologically richest county.

NJM

Invertebrates of Wales. A review of important sites and species by **Adrian Fowles**. Pp. 150, with numerous colour and b/w plates. Joint Nature Conservation Committee, Peterborough. £27.50 from Natural History Book Service Ltd., 2-3 Wills Road, Totnes, Devon TQ9 5XN.

Adrian Fowles is the Invertebrate Ecologist for the Countryside Council for Wales and is well qualified to be the author of this important work.

Invertebrates of Wales is a well produced volume which will appeal to the general field naturalist as well as the invertebrate specialist. Its appearance is timely, as recording moves more and more toward facilitating the production of site-based records as opposed to the traditional species-based recording of the past.

The important invertebrate sites of three major regions, North Wales, Dyfed-Powis, and South Wales are each described under the following headings: Introduction, Coastlands, Woodlands, Lowland heaths and grasslands, Open water and its margins, Lowland peatlands, and Uplands.

The first of the four appendices describes 115 notable sites for the conservation of Welsh invertebrates. The varied habitats are excellently illustrated by colour plates and the text of the book is carefully researched although presented so as to be easily assimilated by the non-specialist. The author points out that because of a lack of understanding of the requirements of invertebrates, conservation of some nature reserves has not always been in the interests of the invertebrate populations, especially where over-riding priority has been given to plant communities. Some of the sites described are nationally well-known but others are not, so that it would make an admirable guide to those contemplating visiting Wales. The other three appendices are of practical use: there is a list of those organisations concerned with the conservation of insects in the Principality, a selected biblography, and a list of protected Welsh invertebrates. In addition there is a general index, an index of localities and an index of invertebrate species. The general index is comprehensive, making the work a valuable reference tool.

The author points out that many sites are underworked and there is a need for more information to be collected and compiled on the Invertebrate Site Register to ensure that notable sites are protected.

This is a book which will be greatly appreciated by invertebrate specialists and all who are involved in nature conservation.

LM

EVIDENCE FOR INCREASED LEVELS OF IMPOSEX IN *NUCELLA LAPILLUS* (L.) POPULATIONS ON THE NORTH-EAST COAST OF ENGLAND

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ABSTRACT
Direct and indirect evidence of imposex in the dogwhelk *Nucella lapillus* was collected from fourteen sites on the north-east coast of England, between the Tees estuary and Flamborough Head. Imposex was recorded from all of them and at higher levels (non-significant trend) at sites having higher levels of boating activity. Comparison of data collected at six sites in 1994 with data collected from the same sites in 1991 suggests an increase in imposex levels during the intervening three years.

INTRODUCTION

Antifouling paints containing organotin compounds as a biocide have been available since 1961, and in widespread use in Britain since the early 1970s (Stebbing, 1985). By 1987, a considerable body of evidence existed linking organotin compounds (and especially tributyltins, or TBTs) in the water column, with deformities, mortalities and population crashes of a number of species, but particularly molluscs (e.g. Alzieu & Heral 1984, Alzieu & Portmann 1984, Bryan *et al* 1986; 1987, Gibbs *et al.* 1987, North Sea Task Force 1994). Concern over the toxicity of TBTs in Britain was such that in 1987 the use of antifouling paints containing them was banned on boats of less than 25m length and on aquaculture cages (Evans *et al.* 1991). Since that time the effects of TBTs (notably the incidence of imposex in the dogwhelk *Nucella lapillus*) have been monitored and in general (in the case of the dogwhelk) a recovery has been observed (e.g. Evans *et al.* 1994, Douglas *et al.* 1994; Spence *et al.* 1990).

Imposex is a term which was originally used by Smith (1971) to describe the super-imposition of male characters onto unparasitzed females of gonochoristic gastropods. Since the primary effect of TBTs upon *Nucella* is causation of the development of a penis and vas deferens in female animals, the term has been adopted to describe TBT poisoning and is now synonymous with it. Severe imposex in *Nucella* can cause sterility and finally death in female animals, resulting in male biased populations and reduced recruitment leading to a population collapse. Whilst some studies (e.g. Gibbs *et al.* 1987) do use vas deferns development as an indicator of imposex, and hence of TBT pollution, Smith (1981) has shown that penis size alone is the easiest character to measure; studies such as that of Bryan *et al.* (1986) have demonstrated the suitability of considering this single character in investigations of imposex levels.

The aims of the current study were threefold: firstly, to collect a baseline data set on the populations of dogwhelks present at sites on the north-east coast of England between the Tees Estuary and Flamborough Head and to ascertain the incidence of imposex (presumed to be TBT related) in these animals; secondly, to examine the relationship between imposex and levels of boating activity at the 1994 survey sites; and finally, to compare 1994 levels of imposex with those found during a survey carried out by the National Rivers Authority (NRA) in 1991.

Methods

The 1994 survey

Fourteen sites between the estuary of the River Tees and the headland at Flamborough were chosen because of their accessibility, their varying levels of boating activity and proximity to harbours, and, in the case of six of them, because they had been visited during the 1991 survey. From north to south the sites (the six sampled in both surveys being suffixed by an asterisk) visited were: Redcar Rocks, Staithes*, Runswick Bay, Saltwick Bay*, Robin Hood's Bay, Boggle Hole*, Burniston*, Scalby Ness, Black Rocks, White Nab, Cornilian Bay*, Cayton Bay, Filey Brigg* and North Landing (Figure 1). Redcar

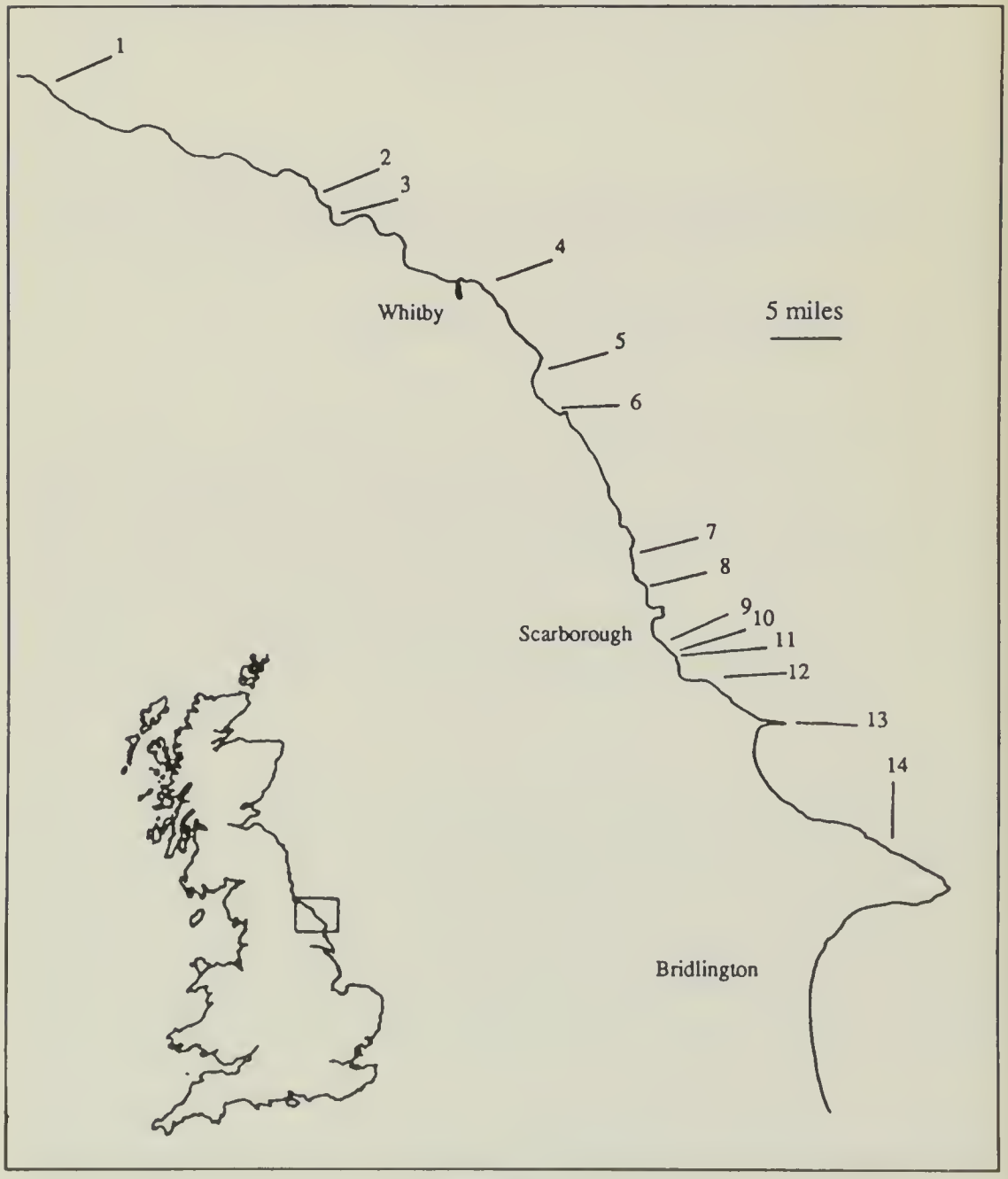

FIGURE 1

Location of study sites. 1 = Redcar Rocks, 2 = Staithes, 3 = Runswick Bay, 4 = Saltwick Nab, 5 = Robin Hood's Bay, 6 = Boggle Hole, 7 = Burniston, 8 = Scalby Ness, 9 = Black Rocks, 10 = White Nab, 11 = Cornelian Bay, 12 = Cayton Bay, 13 = Filey Brigg, 14 = North Landing.

Rocks, Saltwick Bay, Black Rocks, White Nab and Cornilian Bay were considered as having levels of boating activity (either at the site or close to the site) sufficient to cause possible TBT contamination, the remainder were considered as having little or no boating activity.

Each site was visited once, at low tide, between 28 January and 12 March 1994, by GWS and one other surveyor. During each visit, the survey team spent 15 minutes searching the shore between MLWN and MTL (the area where dogwhelks predominate) (Crothers 1985), paying particular attention to crevices and boulder spaces, and collecting all of the dogwhelks encountered. A sub-sample of 30 mature animals was brought to the laboratory and the remainder returned to the shore after ageing (as either mature or immature) and measuring. Animals were considered to be mature if they possessed a row of 'teeth' on the inner surface of the shell aperture (Feare 1970). If fewer than thirty mature animals were collected all of them were removed to the laboratory. Occasionally an empty *Nucella* shell, or one inhabited by a hermit crab *Eupagunus bernhardus* (L.), was mistakenly collected.

In the laboratory animals were killed by immersion in almost boiling water. Their shells were cracked and the animals were sexed following guidelines given by Gibbs *et al.* (1987). If a penis was present it was measured. As a measure of the level of imposex at each site, the relative penis size index (RPSI) was calculated (Gibbs *et al.* 1987) as mean female penis length cubed, divided by mean male penis length cubed, multiplied by 100. It should be noted that although GWS was a member of each survey team and measured some of the animals in each sample, the second member of the team varied and the remainder of each sample was measured by either LJJ or FC.

As a measure of abundance the number of animals collected (N) per surveyor minute of survey time (i.e. N/30) was calculated after Evans *et al.* (1991).

The 1991 survey

Data from the survey were available only as the values tabulated in the report by Morris, (1991) in which the 1991 survey protocol is reported. Briefly, a number of sites were visited, data from six of which contribute to the current study. From each site a minimum of 30 mature animals ('toothed') (Feare 1970) were collected and dissected. RPSI values were calculated (after Gibbs *et al.* 1987). As in that report RPSI values and percentages of mature females for 1991 are corrected to the nearest whole number in Table 1, and samples sizes simply referred to as 30+.

Results

Comparison of the 1991 and 1994 survey results

Evidence of imposex (the presence of a penis) was recorded from all of the mature female *Nucella* sampled during the 1991 survey. In 1994 evidence of imposex was recorded from all of the mature female *Nucela* collected from 11 of the 14 study sites, and in more than 90% of those collected from the remainder (Table 1). Comparisons of the observed levels of imposex, as indicated by RPSI values in 1991 and 1994, were made by using G tests (Sokl & Rholf 1981) which compared the ratio of the RPSI value of 1991 and 1994 with a theoretical ratio of 1:1 which would be expected under the tested null hypothesis that no change in RPSI value had occurred between the two surveys. (As 1991 data were available only as values expressed to the nearest whole number, 1994 data were similarly treated prior to testing). The results of these tests (Table 1) show a statistically significant increase in RPSI value at four of the six sites, a non-significant trend in the same direction at the fifth, and no change at the remaining site. Thus it would appear that RPSI values, and therefore imposex levels, have increased at these sites during the period from 1991 to 1994.

Comparison of the percentages of females in the population of mature *Nucella* found at the six sites did not reveal trends towards lower values in the 1994 survey (compared with the 1991 survey) as might have been expected given the increase in RPSI values. Females were found to be less common in 1994 at Staithes, Cornelian Bay and Filey Brigg (10.4,

TABLE 1
Abundance of *Nucella lapillus*, direct and indirect evidence of imposex

Site	1994 Survey							1991 Survey			Comparison of Surveys	
	N_1	N_2	A_1	%a	%b	%c	RPSI	N_2	%b	RPSI	Gadj	Significance
Redcar Rocks	35	30	1.17	11.4	26.6	100	73.61					
Staithes	125	30	4.16	72.0	36.6	100	30.09	30+	47	22	1.22	N.S.
Runswick Bay	135	30	4.50	53.3	36.6	100	20.23					
Saltwick Bay	80	30	2.66	28.8	46.6	100	36.83	30+	30	9	18.11	***
Robin Hood's Bay	289	30	9.63	85.5	10.0	100	7.17					
Boggle Hole	326	30	10.86	74.1	40.0	91.6	17.84	30+	28	18	6.20	*
Burniston	186	30	6.20	81.2	40.0	91.6	26.18	30+	30	11	10.22	**
Scalby Ness	186	22	6.20	88.2	63.6	100	30.79					
Black Rocks	29	17	0.96	41.4	47.0	100	34.26					
White Nab	102	30	3.40	49.0	33.3	90	25.03					
Cornelian Bay	74	30	2.46	31.1	20.0	100	37.86	30+	33	15	10.22	**
Cayton Bay	48	15	1.60	68.8	53.5	100	43.03					
Filey Brigg	57	29	1.90	38.6	6.6	100	49.81	30+	36	12	24.82	**
N. Landing	122	28	4.06	77.1	35.7	100	36.61					

N_1 = total number of *Nucella* found during the suvery; N_2 = number of mature *Nucella* collected; A_1 – abundance (see text);
%a = percentage of population which were immature, %b = percentage of mature population which were female;
%c = percentage of mature females having a penis; Gadj = value of Gadji comparing ratio of 1991 RSPI to 1994 RSPI with 1:1 ratio (see text);
N.S. denotes no significant different, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.

13, and 29.4% decreases respectively), but were more common at Saltwick Bay, Boggle Hole and Burniston (16.6, 12, and 10% increases respectively) (Table 1).

Comparison of the Sites Surveyed in 1994

RPSI values were not statistically significantly higher at the sites considered as having sufficient levels of boating activity to cause TBT related imposex than at sites with little or no boating activity (Mann-Whitney test (Sokal & Rholf 1981) $w = 47$, $p>0.05$). However the trend in the data did suggest higher RPSI values at sites of higher boating activity (median = 36.83, low activity median = 30.09).

Similarly, no statistically significant difference was found between the percentages of mature female *Nucella* at sites of higher and lower boating activity (Mann-Whitney test, $w = 35$, $p>0.05$). In this case, the trend apparent from the data suggested higher percentages of mature females at sites of lower boating activity (higher activity median = 33.2, lower activity median = 36.6) as would be expected given the trend in RPSI values. This apparent trend for higher boating activity to be linked to higher levels of imposex is further supported by comparisons of both the abundance of animals and the percentage of immature *Nucella* found at the sites. Both are indicators of the level of recruitment to a site which is known to be low at sites suffering high levels of TBT contamination and imposex (Evans *et al.* 1991). *Nucella* were found to be statistically significantly more abundant, and populations were found to have higher percentages of immature animals at sites having lower levels of boating activity (Mann-Whitney test; $w = 21$, $p<0.05$ and $w = 17$, $p<0.01$ respectively).

Discussion

The data presented provide evidence of high levels of imposex in populations of *Nucella* on the north-east coast of England between the Tees Estuary and Flamborough Head. As would be expected given that the TBTs presumed to cause imposex are a constituent of antifouling paints (Stebbing 1985), levels of imposex (RPSI values) tended to be higher at sites having higher levels of boating activity of the type unaffected by current legislation. Although this relationship was not demonstrated to be a statistically significant one, it was supported by evidence that percentages of both mature females and immature animals, and animal abundance were all lower at sites of higher boating activity. These are characteristics of populations suffering from imposex, and these findings are in agreement with the established literature (e.g. Bryan *et al.* 1986, Douglas *et al.* 1994, Evans *et al.* 1994, Spence *et al.* 1990). However, relatively high levels of imposex or evidence suggestive of high levels of imposex (poor recruitment, male biased populations, low population abundance) were found at all sites. This could be due to the presence of an in-shore movement of large ships (>25m in length) along this section of the coast, and a tendency for large vessels to spend periods of some days lying off-shore at sites such as Scarborough (GS, LJT, FC, *pers obs*). It is possible that TBTs leaching from the artifouling paints of such vessels, too large to come under the terms of the 1987 ban (Evans *et al.* 1991), are brought on-shore by tidal currents and drifts (Eisma 1987).

Whilst these data do agree with observations made linking imposex levels of boating activity, (e.g. Evans *et at.* 1991) they do not agree with the findings of studies concerned with the *Nucella* populations of the north-east coast of England north of the Tees Estuary and those of the Isle of Cumbrae, Scotland (Evans *et al.* 1991, Douglas *et al.* 1994 and, Evans *et al.* 1994). These papers all provide evidence that there has been a reduction in imposex levels and a recovery of populations effected by imposex following the 1987 ban, whilst the current study suggests that at the six sites investigated, the reverse is in fact true.

Acknowledgements

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A NEW PINE MARTEN *MARTES MARTES* (L.) RECORD FOR THE NORTH YORKSHIRE MOORS: SKULL DIMENSIONS AND CONFIRMATION OF SPECIES

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INTRODUCTION

There has been a history of recording which suggests a long occupation of the North York Moors area by pine martens *Martes martes* (L.) (Howes 1984, Strachan *et al.* in press). However, almost all have been of sightings. The last definite record (i.e. a body) was of one shot near Greenhow plantation (NZ 5803) in 1983, before legal protection; the one previous to this was of a road casualty near the same plantation in 1972 (both reported to Strachan *et al.* in press). Hence, it was of considerable interest when a skull, purported to be pine marten, was obtained in the same Greenhow/Broughton area in 1993. However, confirmation of species is essential in order to exclude the possibility of its being one of two other martens. Escaped beech marten *M. foina* (Erxleben) have been reported as living wild in England (Baker 1990), and there is currently much interest regarding their long term presence in the British fauna (Burton 1994). Both this species and American marten *M. americana* (Turton) have been ranched for fur in England (Bassett 1957). The latter may have been sold into private collections and are said to have been used in the past to repopulate areas including Yorkshire (Strachan *et al.* in press) and to have occurred as a road casualty in Devon in 1980 (Downes 1994). There is still much uncertainty as there is seldom material for close examination; also, it is impossible to separate *M. martes* and *M. americana* easily on pelage and appearance, so sightings could be of either, or indeed perhaps *M. foina*. Hence the importance of this specimen from a 'key' area, for confirmation (i) that the North Yorkshire marten population may still be extant and (ii) that there is no evidence that it is not of the native species.

RESULTS

The record

A marten, said to be a pine marten, was accidentally killed in a snare set for foxes *Vulpes vulpes* by a gamekeeper. The body was buried with several other dead predators at the time and the skull only was recovered five months later. It was then cleaned and retained by CHC. No other material is available. The animal was caught *c.* 1st November 1993 near to Ingleby Greenhow and Broughton (map ref. NZ 5703) in the Cleveland Hills of the North York Moors, North Yorkshire.

Skull dimensions

Seventeen dimensions were measured to 0.05mm using dial calipers to determine the size of this skull (Table 1). These were as used and defined by Corbet (1964) and Anderson (1970). (CBL) Condylo-basal length. (TL) The greatest length. In this specimen, from the incisors to the tip of the sagittal crest. (PL) Palatal length. (ZB) Greatest width across the zygomatic arches. (ML) Mandible length. (BCW) Greatest width across the brain case. (MB) Mastoid width. (INB) Width at interorbital constriction. (POP) Width across postorbital processes. (POC) Width at postorbital constriction. (POP-POC) Distance from postorbital process to postorbital constriction. (LC-M1) Length of maxillary tooth row from canine to molar. (LC-M2) Length of mandibular tooth row. (WI3-I3) Width across six upper incisors. (WC-C) Rostral breadth over upper canines. (WP4-P4) Width across cheek teeth at posterior of upper premolar 4. (SC) Greatest height of sagittal crest.

TABLE 1

Lengths in mm of 32 dimensions of skull and teeth of the 1993 Yorkshire specimen of *M. martes*. See text for explanation of abbreviations.

Dim.	mm.	Dim.	mm.	Dim.	mm.	Dim.	mm.
CBL	91.15	POP	32.7	SC	5.75	LUP4PC	3.02
TL	97.85	POC	22.95	CUS	11.55	WUP4PC	6.20
PL	46.8	POP-POC	12.2	CLS	11.45	WUP4BL	3.67
ZB	58.15	LC-M1	34.65	LCU	6.27	WUM1	9.23
ML	64.2	LC-M2	40.25	WCU	3.75	LUM1 inner	7.79
BCW	41.5	WI3-I3	8.9	LUP3	6.22	LUM1 outer	4.76
MB	44.9	WC-C	20.0	WUP3	3.54	LLM1	11.50
INB	25.05	WP4-P4	29.8	LUP4	9.06	LLM1TR	7.51

Dental dimensions

The separation of the martens with certainty requires measurement and description of small dental characteristics as defined by Anderson (1970). The dental formula of the martens is 3/3, 1/1, 4/4, 1/2. Both left and right teeth were measured for the following dimensions and the means given in Table 1. Lengths are measured down the length of the tooth row and widths across it.

The size of upper (CUS) and lower (CLS) canines from alveolus to tip, measured on the anterior curve. Upper canine length (LCU) and width (WCU) at alveolus level. The length (LUP3) and width (WUP3) of the third upper premolar. The fourth upper premolar is 't' shaped with an anterior protocone projecting inwards from the main blade (see Plate 1).

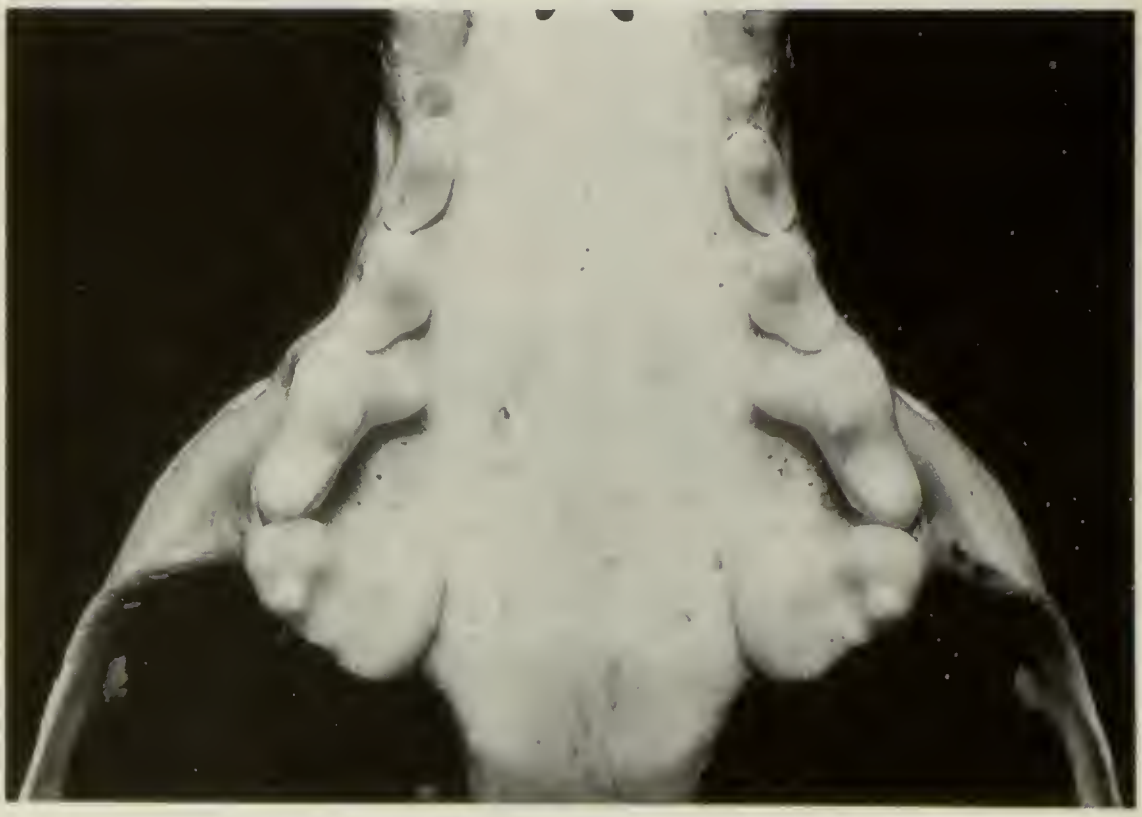

PLATE 1

The palate of the 1993 Yorkshire *M. martes* skull posterior to the canines, showing the four premolars and single molar on each side. The shapes and relative dimensions of these teeth are diagnostic in the identification of marten species.

Measurements were made along its tooth-row length (LUP4); across the width of its main blade (WUP4BL); across the protocone from anterior to posterior (LUP4PC); across the width of the blade plus protocone (WUP4PC). The first upper molar is "dumbell" shaped with varying enlargement of the inner moiety (see Plate 1). Measurements were made of its transverse width (WUM1) and the anterior to posterior dimensions of the inner (LUM1 inner) and outer moieties (LUM1 outer). The lower first molar, or carnassial, has a central pointed protoconid. Measurements were made along the greatest total length of the tooth (LLM1) and along the length of the trigonid from anterior edge of tooth to posterior edge of protoconid (LLM1TR) .

Differences between skulls and teeth of M. martes *and* M. foina
(1) The skull of *M. martes* is longer (CBL).
(2) The zygomatic breadth (ZB) of *M. foina* is greater relative to CBL .
(3) The palate (PL) is shorter relative to CBL in *M. foina* .
(4 & 5) The width across cheek teeth (WP4-P4) is greater relative to CBL in *M. foina*, as is the width across the incisors (WI3-I3).
(6) The ratio of width across upper canines (WC-C) to width across cheek teeth (WP4-P4) is smaller in *M. foina*.
(7 & 8) The distance (POP-POC) from postorbital process to postorbital constriction is short in *M. foina*, with straight sides, whereas it is long with convex sides in *M. martes*.
(9) The zygomatic arches have the highest point in the middle in *M. foina* but posteriorly in *M. martes* (see Plate 2).
(10 & 11) Upper premolar 3: This is biconvex in *M. foina* but with a concave outer contour in *M. martes*. Width (WUP3) per unit length (LUP3) ratio is larger in *M. martes*.
(12, 13, 14, 15) Upper premolar 4: This tooth is longer (LUP4) relative to CBL and to

PLATE 2
Lateral view of the 1993 Yorkshire *M. martes* skull. Note highest point of zygomatic arch is at the posterior. Also, the foramen mentale at the anterior end of the mandible are wide apart.

width of upper molar 1 (WUM1) in *M. foina*. The protocone is more developed in *M. martes* with the length of lateral protocone (LUP4PC) about equal to width of main tooth blade (WUP4BL). The protocone width (WUP4PC) is also longer relative to length of the tooth (LUP4) in *M. martes*.

(16) Upper molar 1: The inner moiety (LUM1 inner) is greatly enlarged in *M. martes* relative to tooth width (WUM1), with LUM1 inner almost twice as large as LUM1 outer (see Plate 1). The inner moiety is much smaller in *M. foina*.

(17) Mandible: The two foramen mentale are relatively far apart in *M. martes* (range 5.9-9.6mm) and close together in *M. foina* (2.0-3.4mm) (Anderson, 1970) (see Plate 2).

(18) Lower molar 1: The ratio of trigonid length (LLM1TR) to tooth length (LLM1) is larger in *M. foina*.

Ratios calculated from the mean data for *M. martes* and *M. foina* taken from Coues (1877) and Anderson (1970) (Table 2) allow comparison with those for the Yorkshire specimen. In the latter the length of the inner moiety of the first upper molar is 1.637 times that of the outer moiety and the foramen mentale are 6.2mm apart. Thus on 17 out of the above 18 counts, the present specimen tends towards *M. martes*. Only in the very wide zygomatic breadth (ZB) does it tend towards *M. foina*.

TABLE 2

Mean condylobasal lengths of male *M. foina*, *M. americana* and *M. martes*, together with ratios of various dimensions of their skulls and teeth calculated from data by (1) Anderson (1970) and (2) Coues (1877). Ratios for the 1993 Yorkshire specimen have been calculated from the data in Table 1 for purposes of comparison. Ratios POC to POP may be low and ZB to CBL may be high, due to age.

Ratio of dimensions	*M. foina*	*M. americana*	*M. martes*	North Yorkshire specimen	Reference for data
Mean CBL in mm (n).	81.70(56)	76.64(27)	86.92(31)	91.15(1)	1
ZB to CBL	0.628	0.552	0.594	0.638	1
ZB to CBL	0.591	0.501	0.549	0.638	2
PL to CBL	0.488	0.492	0.513	0.513	1
WP4-P4 to CBL	0.352	0.308	0.326	0.327	1
WI3-I3 to CBL	0.111	–	0.100	0.098	1
WC-C to WP4-P4	0.614	0.604	0.633	0.671	1
POP-POC to POP	0.269	0.332	0.403	0.373	2
POP-POC to POC	0.341	0.452	0.495	0.532	2
POP-POC to INB	0.343	0.420	0.476	0.487	2
POC to POP	0.791	0.734	0.814	0.702	2
WUP3 to LUP3	0.510	–	0.529	0.569	1
LUP4 to CBL	0.114	0.097	0.101	0.099	1
LUP4 to WUM1	1.070	1.011	1.009	0.982	1
LUP4C to WUP4BL	0.656	–	0.809	0.823	1
WUP4PC to LUP4	0.618	0.618	0.658	0.684	1
LUM1 inner to WUM1	0.678	0.637	0.742	0.844	1
LLM1TR to LLM1	0.716	0.728	0.663	0.653	1

Differences between skulls and teeth of M. martes *and* M. americana

There are fewer differences and many similarities between *M martes* and *M. americana* and some authorities (e.g. Hagmeier 1961) consider them to be variants of a single circumboreal species. There are, however, some differences which are quite marked.

(1) *M. americana* is much smaller (CBL) than either *M. martes* or *M. foina*. The largest male CBL out of 205 *M. americana* of nine subspecies measured by Anderson (1970) was only 87.4mm with a mean of 80.09mm. The same author measured 121 male *M. martes* from 11 European countries, including Britain, and found the largest CBL to be 90.3mm (from Sweden) with a mean of 85.35mm.
(2) Width across cheek teeth (WP4-P4) is smaller in *M. americana* relative to CBL than either *M. foina* or *M. martes*.
(3 & 4) The distance from postorbital process (POP) to postorbital constriction (POC) is shorter in *M. americana* than *M. martes* with the sides only slightly convex and sometimes straight.
(5) Upper molar 1: The inner moiety of *M. americana* is not as greatly expanded as in *M. martes*, with the ratio (LUM1 inner:WUM1) smaller than either *M. martes* or *M. foina*.
(6) Lower molar 1: The ratio of trigonid (LLM1TR) to tooth length (LLM1) is larger in *M. americana* than in either *M. foina* or *M. martes* (the last being the smallest).

Comparison with the calculated ratios from the mean data for the two species in Table 2 shows that on all the above counts the Yorkshire specimen again tends towards *M. martes*.

Other martens

Because of the very large size, the possibilities of escaped American fisher *M. pennanti* (Erxleben) and European sable *M. zibellina* (L.) were considered. However, both these species have the zygomas regularly arched throughout, with the highest point in the middle, as does *M. foina* (Coues 1877, Anderson 1970). This specimen has the highest point of the arch posteriorly as do *M. martes* and *M. americana* (see Plate 2). There is no doubt that the specimen is of a very large example of *M. martes*.

Sex and age of specimen

The original finder considered the specimen to be a male and in this analysis was taken to be a male on the following three criteria. (i) There is a marked sexual dimorphism in size in the martens with the male much the larger (Anderson 1970). (ii) The presence of a considerably developed sagittal crest (Table 1) (see Plate 2) as found in other male mustelids, e.g. badger *Meles meles* (Neal & Cheeseman 1991). (iii) The large size of the canines from alveolus to tip (Table 1). Also the length of the upper canines at the alveolus ranged from 4.5 to 4.9 (n = 31) in the male *M. martes* and 3.7 to 4.4 (n = 20) in the females examined by Anderson (1970). This specimen measured 6.27mm (Table 1). Consequently the specimen was compared with the measurements of male martens from the literature.

There are several factors which suggest that the animal was of considerable age though not senile. (i) The large size of the sagittal crest which overhung to the posterior. (ii) The skull was covered by bone accretion with no sutures visible. (iii) The teeth were worn, with grooves in the canines, but were not worn out. (iv) The zygomatic breadth (ZB) increases with age in martens whilst the postorbital constriction (POC) decreases (Anderson 1970). The zygomatic breadth (ZB) in this specimen is the widest recorded and its ratio with CBL is outside the species norm, whilst the POC to POP ratio is very small (Table 2). Pine martens are capable of living to 18 years (King 1977).

Size of specimen

The present Yorkshire specimen is larger in all dimensions than any of the 121 male *M. martes* skulls from 11 European countries (including 4 from Britain) examined by Anderson (1970) or the 9 male skulls from Britain and continental Europe examined by Miller (1912) (from the B.M. Natural History collection). Dr Andrew Kitchener (Royal Museum of Scotland) kindly provided the dimensions for 7 recent (1951-1993) Scottish male *M. martes* in their collection. The ranges were TL 83.35-97.5; CBL 81.85-93.9; ZB 50.95-54.05; BCW 36.0-39.7; MB 41.55-43.75mm. Again the present specimen is larger than all these dimensions but one. The CBL of one specimen from Ardgay is larger, though all its other dimensions are smaller than in this Yorkshire specimen. Thus the latter appears

to be one of the largest, if not the largest, recent European *M. martes* skulls so far measured (n = 137).

In addition, Degerbøl (1933) noted that postglacial pine martens were larger and more powerfully built than extant Danish animals and suggested dwarfing in the last few millenia. This is especially noticeable in the size of the lower carnassial. The mean LLM1 (n = 37) of postglacial *M. martes* was 10.99 with 21 measuring 11.0mm or more. Only 1 out of 34 recent Danish specimens had an LLM1 of 11.0mm; the mean being 10.18mm. Similarly 33 postglacial specimens had a trigonid length of 7.0mm or more, whereas only 6 recent specimens had a trigonid length of 7.0mm and none exceeded it. One postglacial specimen from Norway had "great length and breadth of the skull" with CBL 91.5 and ZB 58mm (Lund 1951). Thus the present Yorkshire specimen is comparable in size with these large postglacial animals.

Conclusions

Although one animal does not make a population and it could be said that this animal is dead and may be the last one, the definite recent presence of one further pine marten in an area where there have been past sighting records suggests that the North York Moors population may still be extant. Where one may have lived many years and grown large, presumably so can others.

One could speculate that the wide flare of the zygomatic arches in this specimen might be the result of long isolation of a small population as the second largest individual ZB:CBL ratio (53.8:86.4mm = 0.623) is from another northern English male (Cumberland:Miller 1912).

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PRELIMINARY STUDY OF THE LICHEN FLORA OF SPURN POINT, EAST YORKSHIRE

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Spurn Point and its predecessors have undergone many changes: the impact of the sea on its physiography has been profound, dramatically changing its shape and affecting its stability. De Boer (1963) provides a fascinating and detailed historical account of changes over the past millenium, showing how it has evolved from predecessors which lay up to 3.2 km to the east of its present-day position; in charting its history, he demonstrates the influence of the sea on its physical shape and the numerous major breaches which have from time to time converted Spurn into an island.

Unquestionably, the lichen flora has been greatly influenced by these changes since most species are intolerant of disturbance. However, other disturbances due to human impact over the past few decades have also brought about major changes in the flora. The establishment of lighthouses (the first recorded in 1428), occasional dwellings, a road, railway, artillery camp (1939-1945), sea-defences, etc., have fragmented habitats and radically changed natural plant communities. More than forty years ago, Ainsworth (1951), in his short introduction to the ecology of Spurn Point, already refers to the wartime disturbance, and consequent unsightliness, and its effect on the local flora. There have been numerous additional buildings (many now abandoned) and coastal developments since that time, and human disturbance goes on unabated: no longer are lighthouse-keepers and naturalists the only visitors.

Crackles (1975) in her extensive checklist of the flowering plants of Spurn provides further information on some of these changes, and on the impact of reduced rabbit grazing consequent upon myxomatosis in 1954; the resultant loss of short turf areas, which have not returned as rabbit numbers again increased, has been highly detrimental to the terricolous lichen flora. Short turf, containing 'semi-natural' assemblages dominated by *Cladonia* species, is today mainly restricted to trampled areas around the lighthouse. Shrub-dominated areas from the lighthouse southwards contain some more mature specimens of *Sambucus* and *Salix* which support a few more interesting foliose lichens. However, the most important habitats in terms of lichen diversity are provided by the range of brick, cement and stone substrata of sea defences, and of occupied, unoccupied and demolished buildings.

Unfortunately our knowledge of the past lichen flora of Spurn Point is very sketchy, since only limited recording has been undertaken there, and a major proportion of the earlier determinations made by Wattam (1926, 1928) are questionable in the absence of herbarium material to support them. The lichen checklist of Yorkshire lichens prepared by Watson (1946) is deficient in East Yorkshire (VC 61) records, and there are only three species recorded from Spurn; no doubt he too felt it necessary to omit many of Wattam's records. Visits to Spurn by M. R. D. Seaward (MRDS) in 1969 and 1970, by B. J. Coppins (BJC) between 1967 and 1970 and by D. H. Smith (DHS) in 1992 were unrewarding in terms of lichen diversity counts.

However, a visit by A. Henderson and M. R. D. Seaward in August 1994 provided an opportunity to re-evaluate the lichen flora and assemble a checklist, albeit provisional, of the species present at Spurn Point (or more precisely, the 5.6 km length of peninsula from Warren Cottage, 54/419.150, southwards). A more detailed survey would no doubt add numerous species to this list, but, given the immaturity and/or instability of the dune systems, the presence of artificial substrata (poleophilous habitats) and its subjection to a variety of natural and human disturbances, Spurn Point no longer presents classic natural

habitats for ecological studies of lichens.

The following preliminary checklist, with nomenclature according to Purvis *et al.* (1993), contains 85 taxa (84 species and 1 variety), of which 10 are presumed to be extinct and 11 are doubtful in the absence of herbarium material to support the published records.

Checklist

Acarospora heppii (Naeg. ex Hepp) Naeg. ex Korber Uncommon, on concrete sea-wall.
Aspicilia contorta (Hoffm.) Krempelh. Rare, on concrete wall.
Bacidia bagliettoana (Massal. & de Not.) Jatta Rare, on man-made chalk bank (BJC).
B.sabuletorum(Schreber)Lettau Occasional, on compacted calcareous sandy soils of mature dune area and man-made calcareous bank.
Buellia punctata (Hoffm.) Massal. Occasional, on *Sambucus*.
Caloplaca citrina (Hoffm.) Th.Fr. Locally common, on a variety of man-made calcareous substrata.
C. flavovirescens(Wulfen)Dalla Torre & Sarnth. Occasional, on concrete retaining wall (DHS).
C. holocarpa (Hoffm.) Wade Occasional, on concrete and cement and on lignum of bench.
C. saxicola (Hoffm.) Nordin Rare, on wall of concrete building.
C. teicholyta (Ach.) Steiner Occasional, on cementwork.
Candelariella aurella (Hoffm.) Zahlbr. Occasional on cement work.
C. medians (Nyl.) A. L. Sm. Rare, towards base of wall of concrete building.
C. vitellina (Hoffm.) Müll. Arg. Uncommon, on acidic stonework (MRDS).
Catillaria lenticularis (Ach.) Th. Fr. Uncommon, on concrete and cement work of walls.
[*Cladonia arbuscula* (Wallr.) Flotow Wattam 1926, p. 49 & 1928, p. 316; possibly another *Cladonia* subgenus *Cladina sp.*; either way, probably extinct.]
[*C. cervicornis* (Ach.) Flotow Wattam 1928, p. 316; doubtfully this species.]
C. chlorophaea (Flörke ex Sommerf.) Sprengel Occasional, in dry sandy areas.
[*C. coccifera* (L.) Willd. Wattam 1928, p. 316. On dry heathland; probably extinct.]
C. fimbriata (L.) Fr. Occasional, in dry sandy areas.
[*C. foliacea* (Huds.) Willd. Wattam 1928, p. 316. On dry heathland; probably extinct.]
C. furcata (Huds.) Schrader Occasional, in dry sandy areas.
[*C. gracilis* (L.) Willd. Wattam 1926, p. 49; most likely *C. furcata* and/or *C. rangiformis*.]
C. humilis (With.) Laundon Rare, on dry sandy soil.
C. pocillum (Ach.) O. J. Rich. Occasional, on calcareous sandy soils of mature dune areas.
[*C. polydactyla* (Flörke) Sprengel Wattam 1928, p. 316; doubtfully this species.]
[*C. pyxidata* (L.) Hoffm. Wattam 1926, p. 49; most likely another *Cladonia* sp.]
C. rangiformis Hoffm. Locally common, on calcareous sandy soils of mature dune areas and on man-made calcareous bank.
[*C. uncialis* (L.) Weber ex Wigg. Wattam 1926, p. 49 & 1928 p. 316. On dry heathland; probably extinct.]
Cliostomum griffithii (Sm.) Coppins Uncommon, on bark.
[*Coelocaulon aculeatum* (Schreber) Link Wattam 1928, p. 316. On dry heathland; probably extinct.]
Collema crispum(Huds.)Weber ex Wigg. Occasional, on sandy soils influenced by crumbling mortar of demolished buildings.
C. tenax (Swartz) Ach. Locally frequent, on sandy calcareous soils, occasionally influenced by crumbling mortar of demolished buildings.
var. *ceranoides* (Borrer) Degel. Frequency and ecology as var. *tenax*.
Diploicia canescens (Dickson) Massal. Occasional, on dry walls, often nutrient-enriched.
Diplotomma alboatrum (Hoffm.) Flotow Occasional, on mortar pointing of dry walls.
[*D. epipolium* (Ach.) Arnold Wattam 1928, p. 316; possibly only a morph of the previous species]

Evernia prunastri (L.) Ach. Rare, a few thalli on a single *Salix*.
[*Gyalecta jenensis* (Batsch) Zahlbr. Wattam 1928, p. 316; doubtfully this species.]
[*Hypogymnia physodes* (L.) Nyl. Habitat details of earlier record (BJC) unknown.]
Lecania erysibe (Ach.) Mudd (including forma *sorediata*) Occasional, on concrete and cement.
Lecanora albescens(Hoffm.)Branth & Rostrup Locally frequent, on a variety of man-made calcareous substrata.
L. campestris (Schaerer) Hue Rare, on wall of single building.
L. conizaeoides Nyl. ex Crombie Common, on the bark of a variety of shrubs and trees, occasionally on acid stonework.
L. dispersa (L.) Sommerf. Locally common, on a wide variety of man-made substrata.
L. expallens Ach. Occasional, on several shrubs and trees including *Alnus, Salix* and *Sambucus*.
L. muralis (Schreber) Rabenh. Occasional on man-made calcareous substrata.
L. polytropa (Hoffm.) Rabenh. Rare, on pebble in concrete block (BJC).
Lecidella stigmatea (Ach.) Hertel & Leuckert Occasional, on cement work.
Lepraria incana (L.) Ach. Occasional, on bark at the bases of shrubs and trees.
Leptogium schraderi(Ach.)Nyl. Occasional, on compacted ground and on man-made calcareous bank.
L. turgidum (Ach.) Crombie Locally frequent, on compacted ground.
Micarea denigrata (Fr.) Hedl. Occasional, on lignum, more rarely on other substrata.
M.erratica (Körber) Hertel, Rambold & Pietschm. Rare, on pebble in concrete block (BJC).
M.nitschkeana (Lahm ex Rabenh.) Harm. Rare, on *Sambucus*.
[*Parmelia delisei* (Duby) Nyl. Wattam 1928, p. 316; doubtfully this species.]
[*P. glabratula* (Lamy) Nyl. Rare, on Sambucus (BJC) ; possibly the next species.]
P. subaurifera Nyl. Uncommon, just a few thalli on *Sambucus* and a single *Salix*.
P. sulcata Taylor Occasional, a few thalli on several shrubs and trees.
[*Peltigera canina*(L.)Willd. Wattam 1926, p. 49; possibly this species, but most likely another *Peltigera* sp.]
[*P. horizontalis* (Huds.) Baumg. Wattam 1928, p. 316; doubtfully this species]
P. praetextata (Flörke ex Sommerf.) Zopf Locally frequent, on compacted soil.
P.rufescens(Weis)Humb. Locally frequent, on sandy calcareous soils of mature dune areas.
Phaeophyscia orbicularis(Necker)Moberg Locally frequent on calcareous substrata, occasional on shrubs and trees.
P. nigricans (Flörke) Moberg Rare, on calcareous stonework.
Physcia adscendens(Fr.)H.Olivier Occasional on calcareous stonework and shrubs, mainly *Sambucus*.
P. caesia (Hoffm.) Fürnröhr Occasional, on man-made calcareous substrata, usually well lit and/or nutrient-enriched.
P. tenella (Scop.) DC. Occasional on trees and shrubs, mainly *Sambucus*.
[*Physconia distorta* (With.) Laundon Watson 1946, p. 31; doubtfully this species.]
Porpidia crustulata(Ach.)Hertel & Knoph Rare, on stonework of a single building (MRDS).
[*Pyrenocollema halodytes*(Nyl.)R.Harris Habitat details of former record (BJC) unknown.]
[*Rhizocarpon geographicum*(L.)DC. Watson 1946, p. 34; habitat unknown – now extinct.]
Rinodina gennarii Bagl. Occasional, on nutrient-enriched calcareous substrata.
Sarcogyne regularis Körber Rare, on calcareous wall.
Scoliciosporum umbrinum (Ach.) Arnold Occasional, on calcareous walls.
[*Verrucaria calciseda* DC. Wattam 1928, p. 316; habitat unknown, as is current status.]
V. hochstetteri Fr. Rare, on stone on man-made calcareous bank.

[*V. maura* Wahlenb. Wattam 1928, p. 316; habitat unknown, as is current status.]
V. muralis Ach. Locally frequent, on various calcareous substrata.
V. nigrescens Pers. Locally frequent, on a variety of stonework.
V. viridula (Schrader) Ach. Occasional, on wall coping and sea-wall.
Xanthoria calcicola Oxner Occasional, on calcareous substrata.
X. candelaria (L.) Th.Fr. Rare, on the bark (mainly twigs) of a few shrubs (MRDS) and on wooden fence post.
X. ectaneoides (Nyl.) Zahlbr. Rare, single thallus on cement work.
X. elegans (Link) Th.Fr. Rare, single thallus towards base of wall of concrete building.
X. parietina (L.) Th.Fr. Locally frequent, on variety of stonework and shrubs.

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BOOK REVIEW

Random-access Guide to Selected British Hawkweeds by **Jim Bevan,** based on a computer program by **Colin J. Legg**, and illustrated by **K. J. Adams**. One 3.5 inch floppy disk plus 24 page instruction booklet with diagrams. National Museum of Wales, Cardiff CF1 3NP and Field Studies Council. 1992. £15.00, plus 70p. postage & packing.

This is a computer program for identifying the notoriously difficult species of *Hieracium*. Whether they are true species is debatable as they reproduce mostly by apomixis and many of the supposed species are probably just different lines of the same species maintained by the non-sexual production of seed. Leaving this aside, I have gone out and collected various specimens of *Hieracium* and found this key to be excellent at 'running them down'. If the proof of the pudding is in the eating, I can certainly put a name to specimens which I would not have got as far with before. Whether the computer program gives a correct identification is another matter.

The program will run on a computer as basic as a BBC system or on a MS-DOS system. It is easy to use and the manual is very helpful, especially with the terminology used for different plant characters used in the key. I would recommend this to botanists, but any 'computer diagnosis' would, in my opinion, require confirmation by an expert taxonomist. A good microscope is still necessary for some species as they are distinguished by leaf indumentum. Beware – the *H. pilosella* group is not included as they now reside in a separate genus.

ADH

NOTES ON THE DIET OF THE RED FOX (*VULPES VULPES* L. 1758) IN THE PEAK DISTRICT

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Abstract

Fifty fox scats from two areas of blanket bog in the Peak District were analysed for their prey content. The most frequent items were remains of the Red Grouse and Lagomorphs, which occurred in around 50% of the scats. Other prey, including small rodents, shrews, sheep, smaller birds and invertebrates occurred in up to 30% of the scats.

Introduction

This paper presents the results of an analysis of fox scats collected during the course of a study on the Golden Plover *Pluvialis apricaria* population in the Peak District, England. The sample is fairly small and only the frequency of each prey type was recorded, rather than its biomass, a method which has obvious drawbacks. Nevertheless, the results are worth presenting since the diet of the foxes at the particular time and sites concerned here has not previously been studied, and little is known about the impact of fox predation on moorland waders.

Scats were collected by D. W. and P. E. Yalden during their study of the potential impact of recreational disturbance on Golden Plovers (Yalden & Yalden 1988, 1990).

Study Area

The study area comprised two moorland sites. The Snake Summit area (NGR SK0891) is predominantly covered by cotton grass (*Eriophorum vaginatum*), with fringes of crowberry (*Empetrum nigrum*) and bilberry (*Vaccinium myrtillus*) along drainage gullies. The Saddleworth Moor area (NGR SE0505), 13 km N of Snake Summit, is also largely blanket bog dominated by *Eriophorum vaginatum*. *Empetrum nigrum* and *Vaccinium myrtillus* are less common there and more patches of bare peat are present (Yalden & Yalden 1988).

Human impact is stronger on Snake Summit; there are two full-time game-keepers there (none in the Saddleworth Moor area) and Snake Summit is also more frequently visited by tourists (Yalden & Yalden 1988).

Material and Methods

Weekly walks were conducted on both sites throughout the breeding season for moorland birds (mid-April to mid-July) in 1986, 1987 and 1988. In all, 50 fox scats were collected; all of them were dried, weighed and dissected dry. Food remains such as mammal hairs, bird feathers, bones, insect fragments and earthworm chaetae were recorded, described and the amount of each item in each scat was estimated by eye. The keys given by Day (1966) and Debrot (1982) were used to check the fur and feather remains when there were no skeletal elements. Reference collections of skeletons of all the likely prey were also available, and reference was made to keys by Pucek (1981) and Yalden & Morris (1990).

Results

Out of the 50 scats, 38 had been collected at Snake Summit and 12 at Saddleworth Moor. The results are shown in Table 1.

Red Grouse (*Lagopus lagopus*) were the main prey at both sites; no Golden Plover remains were found. Common Rabbit (*Oryctolagus cuniculus*) and Mountain Hare (*Lepus timidus*) remains were equally frequent in analysed samples. Certain determination of the species was impossible in some cases, due to the poor state of scats. The figures for these were therefore combined as Lagomorphs, which collectively were as important to the foxes as Red Grouse.

Most of the scats also contained fragments of plants such as heather, cotton grass and bilberry. Several miscellaneous items such as lead shot, paper tissue, string and small stones were also found.

TABLE 1
Frequency of different food items in 50 Scats collected at Snake Summit (38 Scats) and Saddleworth Moor (12 Scats).

Food Item	Snake Summit		Saddleworth Moor	
	Number	% of Scats	Number	% of Scats
Red Grouse	19	50.0	5	41.6
Fieldfare	3	7.9	–	–
Other Birds	7	18.4	2	16.6
Total Birds	29	76.3	7	58.3
Lagomorphs	18	47.3	7	58.3
Sheep	3	7.9	–	–
Rodents	10	26.3	5	41.6
Insectivores	–	–	1	8.3
Total Mammals	26*	68.4	9*	75.0
Insects	16	42.1	2	16.6
Earthworms	14	36.8	7	58.3

** since scats contained remains of more than one mammal, the figure for total mammal occurrence is reduced in order to avoid double-counting*

Discussion

The majority of previous authors indicate that rodents (especially Field Voles, *Microtus agrestis*) are the main food item in the diet of the Red Fox (e.g. Goszczynski 1974, Lever 1959, Sequeira 1980, Hewson *et al.* 1975, MacDonald 1977). Forbes & Lance (1976) found sheep carrion to be the most numerous component in an environment (Irish blanket bog) similar to the one concerned here .

However, this paper shows the predominance of Red Grouse, *Lagopus lagopus* and Lagomorphs in these foxes' diet. This probably reflects the particular time of the year, when the incubating female Red Grouse are particularly vulnerable to predation. All the scats containing lead shot also contained remains of Mountain Hares or Red Grouse, and it can be assumed that these individuals were wounded. Some of the other Lagomorph remains represented young animals. It is known that fox predation concentrates on heavily parasitised birds (Hudson 1986, Hudson 1992). Hence, although fox predation may be the main cause of Red Grouse mortality (Jenkins *et al.* 1963, Forbes & Lance 1976), the predator's impact actually improves the condition of its prey population.

No significant difference in Red Grouse density between sites was recorded (Yalden, unpublished) during the course of the study, yet in the better keepered area of Snake Summit, Red Grouse remains are slightly more frequent in the prey than the Lagomorphs. The opposite situation applies on Saddleworth Moor, where, however, the number of scats collected was much smaller than on the first site.

As the numbers of visits to both sites were equal, the difference in the numbers of scats probably reflects a real difference in the density of foxes.

Acknowledgements

I would like to express my deepest gratitude to everyone who made my work possible. Dr Derek Yalden gave his kind permission to use his unpublished data as well as his assistance throughout my work. Dr J. Kennaugh and Dr J. Tallis helped me to identify various food items.

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BOOK REVIEWS

British Fungus Flora: Agarics and Boleti; volume 7. Cortinariaceae p.p. by **R. Watling** and **N. M. Gregory**, Pp. 131, including 153 line drawings. Royal Botanic Garden, Edinburgh. 1993. £8.00.

The latest volume in this important series covers a total of ten genera, most of them very small ones, the exceptions being *Galerina* and *Gymnopilus*. If a comparison is made with the 1960 *New Check List*, then of the 82 species dealt with here 38 remain the same, 19 represent name-changes or corrections of former misidentifications and 25 are additions. The corresponding figures for the 49 species of *Galerina* are 20, 7 and 22 species. The increased number of species included in this work is partly due to the adoption of a rather narrow species concept. In addition, *Kuehneromyces* is sunk into *Galerina* while *Phaeogalera* is maintained as distinct from it; this is at variance with the current opinion of several other agaricologists, but such matters will always remain somewhat subjective.

The authors stress in the Introduction that these publications are not monographs, but are

intended to provide keys based on the current state of knowledge. Sadly, the key for *Galerina* does not inspire a great deal of confidence. The first couplet separates those species with facial cystidia from those which lack them. This is a sensible enough approach, and separates out seven species which match the "facial cystidia present" criterion. However, if one then turns to the individual species descriptions, a further six species are described as possessing facial cystidia – indeed for two of these six they are said to be 'abundant' and for another 'numerous' . This state of confusion is compounded by the fact that for two of the species keying out as possessing facial cystidia, *G. clavus* and *G. praticola*, such cystidia are stated in the main text to be rare! Couplet 42, based on spore ornamentation, does not work either – three of the four species keying out as having "spores distinctly ornamented" have "almost smooth" spores according to the species descriptions, where the fourth, *G. hypnorum*, is said to have spores "smooth to minutely roughened".

While it is extremely useful to have the ecological list of species, it is less welcome to see two of the species said to occur amongst *Sphagnum*, *G. permixta* and *G. viscidula*, keying out at couplet 50 as "amongst other mosses, not *Sphagnum*". Unfortunately, these are not the only inconsistencies.

The title of the work appears repeatedly – and unnecessarily – at the top of each double page. It would have been more useful had the relevant genus been shown here. This is particularly the case since the two largest genera, *Galerina* and *Gymnopilus*, both beginning with the same letter, are dealt with consecutively. In addition, no fewer than five of the remaining eight genera begin with the letter 'P'. This, coupled with the position of the species index before the illustrations, with habitat lists and other indexes immediately preceding it, renders finding a particular taxon in a hurry a somewhat frustrating exercise. As with previous volumes, users of the book will probably photocopy the index and insert it at the back.

It is a shame not to be able to welcome this work wholeheartedly, for it contains much valuable information. However, the presence of anomalies and inconsistencies renders it less authoritative than might have been hoped and purchasers may well find themselves annotating it quite extensively. While not quite up to the standard of previous volumes, this nevertheless forms part of an extremely important series which should be on the shelves of all serious field mycologists.

CSVY

Our Way of Life. Heritage, Wildlife, Countryside, People edited by **Desmond Gillmore**. Pp. 215 + numerous colour & b/w plates and line drawings. Wolfhound Press. 1993. £12.99 paperback.

The Introduction justifies the book on the grounds "that there is a need for a general work on the main facets of the Irish countryside". The first full-page plate in the book is a depressing black and white view of Glenmalure in Co. Wicklow, which contrasts starkly with the composite cover in colour. Judging from the review copy, the reader's first impression on glancing through the book must surely be wonderment at the unrealistic washed-out colour plates.

The text reads like a school geography textbook, mining and quarrying, for instance, being referred to as 'extractive industries'. Those parts of the book which deal at some length with the former traditions and customs of the Irish people are accompanied by many old and interesting photographs which, however, do not fit easily with the fine line drawings by Jeanette Dunne. Some of the great Irish traditions such as loch trout and salmon fishing are dealt with briefly, in a negative way. To understand the Ireland of today it is necessary to know much of Ireland's social history, but the selected list of further reading would be heavy going to most, as indeed is much of the book itself.

LM

The Cambridge Encyclopaedia of Ornithology, edited by **Michael Brooke** and **Tim Birkhead.** 362 pages, with 223 colour & 6 b/w plates. Cambridge University Press. 1991. £24.95.

This large format book, well designed and easy to look at, includes contributions from several expert ornithologists and deals with the machinery of ornithology in some detail rather than just the birds themselves. There is much to learn within its pages, which include maps, some showing distribution and migration routes, many graphs and diagrams illustrating such things as bird structure and flight methods, and also many line drawings and photographs of birds.

There are 11 very detailed sections on subjects such as anatomy and physiology, birds ancient and modern, including fossil birds, people and birds, domestic birds and falconry. In short, a very readable volume packed with information which should appeal to those who wish to learn more of what ornithology is all about, rather than simply wanting to know about birds and where to see them. Well worth its price.

JRM

CONTRIBUTORS

Abbott, P. 125
Altringham, J. D. 49-56, 81-94
Archer, M. E. 36, 73-77

Blockeel, T. L. 66, 77-79
Boatman, D. J. 129-137

Chicken, E. 42-43, 56
Coppins, B. J. 117-125
Crackles, F. E. 39
Critchley, C. H. 145-150
Crouch, F. 139-144

Delany, M. J. 47-48, 126
Duncan, J. E. 39-43

Eades, R. A. 36
Earland-Bennett, P. M. 57-60
Edmondson, J. R. 45-46

Frear, P. A. 43
Fryer, G. 3-22, 35-36, 126-128

Golachowiski, M. 155-157
Grant, D. R. 40

Headley, A. D. 128, 154
Henderson, A. 57-60, 151-154
Hodgkiss, I. J. 126

Jefferies, D. J. 145-150
Johnson, L. J. 139-144
Julian, S. 49-56, 81-94

Kirk, B. R. 95-103

Limbert, M. 44-45

Magee, L. 40-41, 138, 158
Mather, J. R. 159
McCarthy, A. J. 103-110
Medd, T. F. 39-40, 41-42
Middleton, R. 67-73
Morgan, N. J. 137-138
Morris, E. 139-144
Munro, I. C. 117-125

O'Brien, S. 81-94

Payne, K. G. 111-116
Payne, J. 22

Rotherham, I. D. 103-110

Scott, G. W. 139-144
Seaward, M. R. D. 48, 57-60, 65-66, 80, 151-154
Shannon, J. C. 43
Tannett, P. G. 65

Vaughan, R. 47, 80

Wardhaugh, A. A. 37-38
Watling, R. 117-125
Woodroffe, G. L. 23-35

Yalden, D. W. 61-65
Yeates, C. S. V. 157-158

INDEX

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